Claims:

1. A system for preventing collapse of the right atrium, right ventricle or pulmonary artery and maintaining blood flow therethrough during beating heart bypass surgery comprising:

a pump and cannula system wherein the cannula is adapted for insertion through the tricuspid valve, through the pulmonary valve and a sufficient length into the pulmonary artery to prevent collapse of the right atrium, right ventricle or pulmonary artery and to maintain partial blood flow therethrough while the beating heart is lifted or displaced during surgery and wherein the pump and cannula are adapted for intake of blood upstream of the pulmonary valve and output of blood into the pulmonary artery while the beating heart is displaced during surgery; and

a cradle for supporting the beating heart while the heart is displaced during surgery and for providing surgical access to lateral or posterior heart vessels.

2. A system according to claim 1 wherein the pump has a priming volume less than about 1000 ml.

3. A system according to claim 1 wherein the pump comprises a reverse flow pump having an adjacent motor and being adapted for operation adjacent to the heart during surgery.

4. A system according to claim 1 wherein the cannula comprises concentric conduits of different lengths and connected to the pump to provide inflow of blood to the pump through the outside conduit and outflow through the inside conduit.

5. A method for performing beating heart bypass surgery which comprises:

inserting the cannula portion of a pump and cannula system through the tricuspid valve, through the pulmonary valve and a sufficient length into the pulmonary artery to prevent collapse of the right atrium, right ventricle or pulmonary artery when the heart is stressed, lifted or displaced during surgery; and

pumping blood from upstream of the pulmonary valve into the pulmonary artery to augment the flow of blood through the pulmonary valve produced by the beating heart.

6. A system for preventing collapse of the right atrium, right ventricle or pulmonary artery and maintaining blood flow across the pulmonary valve during beating heart bypass surgery comprising:

a cannula adapted for insertion through the tricuspid valve, through the pulmonary valve and a sufficient length into the pulmonary artery to prevent collapse of the right atrium, right ventricle or pulmonary artery while the beating heart is lifted or displaced during surgery; and

a pump system adapted for removing blood from the vena cava or the right atrium and transporting the blood external of the heart into the pulmonary artery.

7. A method for performing beating heart bypass surgery which comprises:

inserting a cannula through the tricuspid valve through the pulmonary valve and a sufficient length into the pulmonary artery to prevent collapse of the right atrium, right ventricle or pulmonary artery when the heart is lifted or displaced during surgery;

connecting a pump intake tube through an incision in the wall of the right atrium to remove blood from the right atrium;

connecting the pump outflow tube into the pulmonary artery through an incision in the wall of the pulmonary artery; and

pumping blood from the right atrium through the pump into the pulmonary artery.

8. A method for sustaining sufficient blood flow in the patient during heart surgery which comprises:

inserting the cannula portion of a pump and cannula system through the interior of one side of the heart to extend the cannula into the artery or aorta; and

adjusting the pump output during the surgery to provide sufficient blood flow in the patient during the surgery.

9. A method according to claim 8 wherein the blood flow is pulmonary blood flow to the lungs of the patient.

10. A method according to claim 8 wherein the blood flow is circulatory aortic blood flow to the body of the patient.

11. A method according to claim 8 comprising:

inserting the cannula portion of a pump and cannula system through the interior of each side of the heart to extend one cannula into the pulmonary artery and the other cannula into the aorta; and

adjusting each pump output during the surgery to provide sufficient pulmonary blood flow and sufficient aortic circulatory blood flow in the patient during the surgery.

12. A method for performing beating heart surgery which comprises:

inserting in one side of the heart a cannula or stent adapted to protect the blood flow path through the heart when the stented portion of the heart is collapsed or kinked; and

performing beating heart bypass surgery while the cannula or stent is in place in the heart.

13. A method according to claim 12 wherein the cannula or stent is placed in the right side of the heart.

14. A method according to claim 13 wherein a cannula or stent is placed in the left side of the heart.

15. A kit or parts for beating heart bypass surgery comprising:

a pump and cannula system wherein the cannula is adapted for insertion through the tricuspid valve, through the pulmonary valve and a sufficient length into the pulmonary artery to prevent collapse of the right atrium, right ventricle or pulmonary artery and to maintain partial blood flow therethrough while the beating heart is lifted or displaced during surgery and wherein the pump and cannula are adapted for intake of blood upstream of the pulmonary valve and output of blood into the pulmonary artery while the beating heart is displaced during surgery; and

a cradle for supporting the beating heart while the heart is displaced during surgery and for providing surgical access to lateral or posterior heart vessels.